

PHASE PLATE AND ITS PRODUCTION

Patent number: JP9281337
Publication date: 1997-10-31
Inventor: MOCHIZUKI SHU; IZUMI KIYOUKO; NAKANO SHUSAKU; YOSHIMI HIROYUKI; MOTOMURA HIRONORI; SAKAMOTO YUKIE
Applicant: NITTO DENKO CORP
Classification:
- international: G02B5/30; G02F1/1335
- european:
Application number: JP19960121066 19960418
Priority number(s): JP19960121066 19960418

Report a data error here

Abstract of JP9281337

PROBLEM TO BE SOLVED: To efficiently and stably obtain a stretched film in a required size having no irregular phase difference due to inhomogeneous stretching by using a polycarbodiimide having a specified range of glass transition temp. **SOLUTION:** This phase plate consists of a stretched film of polycarbodiimide expressed by formula $-(R-N=C=N)_n-$ and having 0 to 150 deg.C glass transition temp. In formula, R is a bivalent org. group, n is 1 or an integer ≥ 2 . A polycarbodiimide having < 0 deg.C glass transition temp. is not preferable because the film is in a rubber state at normal temp. and is not easily handled. If the glass transition temp. exceeds 150 deg.C, the crosslinking reaction easily proceeds at the heating temp. for stretching treatment and the film causes coloring, hardening or embrittlement. Considering the handling property and inhibiting property against crosslinking, the glass transition temp. of polycarbodiimide is preferably controlled to 30 to 140 deg.C and especially, 50 to 120 deg.C.

Data supplied from the **esp@cenet** database - Worldwide**BEST AVAILABLE COPY**

Partial Translation of JP 1997-281337

Publication Date: October 31, 1997

Application No.: 1996-121066

Filing Date: April 18, 1996

Applicant: NITTO DENKO CORP

Inventor: Shu MOCHIZUKI

Inventor: Kiyoko IZUMI

Inventor: Shusaku NAKANO

Inventor: Hiroyuki YOSHIMI

Inventor: Hironori MOTOMURA

Inventor: Yukie SAKAMOTO

[0013] For example, a proper organic solvent or the like used when polycarbodiimide is formed can be used as a solvent for preparing the solution of polycarbodiimide. Examples thereof include halogenated hydrocarbons such as tetrachloroethylene, 1, 2-dichloroethane and chloroform; ketones such as acetone, methyl ethyl ketone, methyl isobutyl ketone and cyclohexanone; cyclic ethers such as tetrahydrofuran and dioxane; and a mixed system thereof.

(19) 日本国特許庁 (J P)

(12) 公開特許公報 (A)

(11) 特許出願公開番号

特開平9-281337

(43) 公開日 平成9年(1997)10月31日

(51) Int.Cl. ⁶	識別記号	庁内整理番号	F I	技術表示箇所
G 0 2 B 5/30			G 0 2 B 5/30	
G 0 2 F 1/1335	5 1 0		G 0 2 F 1/1335	5 1 0

審査請求 未請求 請求項の数2 F D (全 4 頁)

(21) 出願番号 特願平8-121066

(22) 出願日 平成8年(1996)4月18日

(71) 出願人 000003964

日東電工株式会社

大阪府茨木市下穂積1丁目1番2号

(72) 発明者 望月 周

大阪府茨木市下穂積1丁目1番2号 日東
電工株式会社内

(72) 発明者 泉 今日子

大阪府茨木市下穂積1丁目1番2号 日東
電工株式会社内

(72) 発明者 中野 秀作

大阪府茨木市下穂積1丁目1番2号 日東
電工株式会社内

(74) 代理人 弁理士 藤本 勉

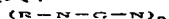
最終頁に続く

(54) 【発明の名称】 位相差板及びその製造方法

(57) 【要約】

【課題】 複屈折による位相差の波長依存性に対する対応性に優れて液晶表示パネル等の補償性に優れており、液晶表示パネルに必要なサイズのものを延伸ムラなく容易に形成できて生産の安定性に優れる位相差板の開発。

【解決手段】 一般式：



(ただし、Rは二価の有機基、nは1又は2以上の整数である。) で表され、ガラス転移温度が0～150℃のポリカルボジイミドの延伸フィルムからなる位相差板。

【効果】 カルボジイミドの硬化反応を抑制して無色透明性を良好に維持しつつ加熱軟化させて操作性よく延伸処理でき、延伸ムラによる位相差ムラのない延伸フィルムが得られて、高速応答性のSTN液晶表示パネル等に適用可能な位相差板が得られる。

【特許請求の範囲】

【請求項1】 一般式：



(ただし、Rは二価の有機基、nは1又は2以上の整数である。)で表され、ガラス転移温度が0～150℃のポリカルボジイミドの延伸フィルムからなることを特徴とする位相差板。

【請求項2】 一般式：



(ただし、Rは二価の有機基、nは1又は2以上の整数である。)で表され、ガラス転移温度が0～150℃のポリカルボジイミドの溶媒による溶液を流延乾燥して得た製膜を延伸処理することを特徴とする位相差板の製造方法。

【発明の詳細な説明】

【0001】

【発明の技術分野】本発明は、複屈折に波長依存性のある液晶表示パネル等における位相差の補償に好適な位相差板、及びその生産安定性に優れる製造方法に関する。

【0002】

【発明の背景】液晶表示パネルでは複屈折による位相差で表示が着色したり、コントラストが低下したりする問題のあることから位相差を補償する必要のある場合があり、そのときにSTN型液晶の如く複屈折による位相差が波長毎に相違して波長依存性を示す場合がある。従来、かかる位相差の補償対策としては、同じ位相差特性を示す液晶表示パネルを重ねる方式もあるが、嵩高化や高重量化等の問題を伴って軽量薄型等の液晶表示パネルの利点が阻害される難点があることから、延伸フィルムからなる位相差板による補償が検討されている。

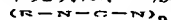
【0003】その延伸フィルムからなる位相差板としては、ポリカーボネートやポリスルホンからなるものが知られていた(特開平2-42406号公報)。しかしながら、ポリカーボネート系位相差板では、波長依存性を示す液晶表示パネルに対する対応性が不十分で補償性に乏しい問題点があった。またポリスルホン系位相差板では、熱変形温度が高く、延伸条件に高度な均質性を要して残留応力が局部的にバラツキやすく、液晶表示パネルに必要なサイズの位相差板を延伸ムラなく得ることが困難な問題点があった。

【0004】

【発明の技術的課題】本発明は、複屈折による位相差の波長依存性に対する対応性に優れて液晶表示パネル等の補償性に優れており、液晶表示パネルに必要なサイズのものを延伸ムラなく容易に形成できて生産の安定性に優れる位相差板の開発を課題とする。

【0005】

【課題の解決手段】本発明は、一般式：



(ただし、Rは二価の有機基、nは1又は2以上の整数

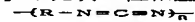
である。)で表され、ガラス転移温度が0～150℃のポリカルボジイミドの延伸フィルムからなることを特徴とする位相差板を提供するものである。

【0006】

【発明の効果】ガラス転移温度が0～150℃のポリカルボジイミドからなることにより、カルボジイミドの硬化反応を抑制して無色透明性を良好に維持しつつ加熱軟化させて操作性よく延伸処理でき、延伸ムラによる位相差ムラのない必要サイズの延伸フィルムを生産の安定性よく効率的に得ることができて、高速応答性のSTN液晶表示パネル等に適用可能な位相差の波長依存性に対する対応性に優れる位相差板を得ることができる。

【0007】

【発明の実施形態】本発明の位相差板は、一般式：



(ただし、Rは二価の有機基、nは1又は2以上の整数である。)で表され、ガラス転移温度が0～150℃のポリカルボジイミドの延伸フィルムからなる。そのポリカルボジイミドとしては、有機ジイソシアネートをモノマー成分として前記一般式で表される構造単位を有し、ガラス転移温度が0～150℃のものであればよい。

【0008】ちなみに前記の有機ジイソシアネートとしては、例えば2, 4-トリレンジイソシアネートや2, 6-トリレンジイソシアネート、1-メトキシフェニル-2, 4-ジイソシアネートや4, 4'-ジフェニルメタンジイソシアネート、3, 3'-ジメトキシ-4, 4'-ジフェニルメタンジイソシアネートや3, 3'-ジメチル-4, 4'-ジフェニルメタンジイソシアネート、4, 4'-ジフェニルエーテルジイソシアネートや3, 3'-ジメチル-4, 4'-ジフェニルエーテルジイソシアネート、o-トリレンジイソシアネートなどの1種又は2種以上が用いられるが、これらに限定するものではない。

【0009】ポリカルボジイミドは、例えば有機ジイソシアネートを有機溶媒中で、ホスホレンオキシド等のカルボジイミド化触媒の存在下に反応させる方式などの適宜な方式で形成したものであってよいが(特開平2-292316号公報、特開平4-275359号公報、J. appl. Polym. Sci. 21, PP1999(1977: L. M. Alberino等))、本発明にては延伸ムラ抑制等の所期の目的を達成するため、ガラス転移温度が0～150℃のポリカルボジイミドであることが必要である。

【0010】ガラス転移温度が0℃未満のポリカルボジイミドでは、常温付近でゴム状のために取扱にくく、延伸処理時の温度制御等も困難で品質の安定した位相差板が得られにくい。一方、ガラス転移温度が150℃を超えるポリカルボジイミドにても、延伸処理を可能とする加熱温度で架橋反応が進行しやすくなり、着色化や硬脆化などの問題を発生する。取扱性や架橋反応抑制性等の点より好ましく用いようポリカルボジイミドのガラス転

移温度は、30～140℃、就中50～120℃である。

【0011】なお前記したカルボジイミド化触媒に用いるホスホレンオキシドの具体例としては、1-フェニル-2-ホスホレン-1-オキシドや3-メチル-2-ホスホレン-1-オキシド、1-エチル-2-ホスホレン-1-オキシドや1-エチル-2-ホスホレン-1-オキシド、3-メチル-1-フェニルホスホレンや3-ホスホレン異性体などがあげられる。

【0012】位相差板は、ポリカルボジイミドを適宜な方式で製膜して延伸処理することにより形成しうが、品質の安定性や生産効率などの点より好ましい製造方法は、ポリカルボジイミドの溶媒による溶液をキャストリング法等の適宜な方式で流延乾燥して得た製膜を延伸処理する方法である。

【0013】ポリカルボジイミドの溶液を調製するための溶媒としては、例えばポリカルボジイミドを形成する際に用いる有機溶媒などの適宜なものを用いる。ちなみにその例としては、テトラクロロエチレンや1, 2-ジクロロエタンやクロロホルムの如きハロゲン化炭化水素類、アセトンやメチルエチルケトン、メチルイソブチルケトンやシクロヘキサノンの如きケトン類、テトラヒドロフランやジオキサンの如き環状エーテル類、それらの混合系などがあげられる。

【0014】ポリカルボジイミド溶液の流延層の乾燥温度としては、得られるフィルムの強度的信頼性や取扱性、架橋反応の抑制による延伸処理時のフィルム破断や延伸不良の防止などの点より、50～150℃、就中60～120℃が好ましい。形成するフィルムの厚さは、目的とする位相差板の位相差特性などにより適宜に決定してよい。一般には、500μm以下、就中5～300μm、特に10～200μmとされる。ちなみに位相差は、複屈折の屈折率差(Δn)と位相差板の厚さ(d)の積($\Delta n \cdot d$)として算出することができる。

【0015】延伸処理は、例えばロール延伸法や長間隙沿延伸法、テンター延伸法やチューブラー延伸法などの適宜な方式で行うことができ、一軸や二軸等の適宜な延伸方式を採ることができる。処理温度は、架橋反応の抑制や延伸ムラの防止などの点より、150℃以下、就中40～120℃が好ましい。常温等の低温では、破断問題等を生じやすく延伸処理性に乏しい。

【0016】延伸条件は、前記の如く一方向のみに延伸する一軸延伸処理でもよいが、耐衝撃性の向上や一方向に引き裂かれやすい性質の緩和等の点よりは、二軸延伸処理方式、就中、直交する二方向に延伸する二軸延伸処理方式が好ましい。その場合の延伸条件は、所定の方向へ1. 1～5倍、就中1. 2～2倍、その方向と直交する方向へ1～2倍、就中1. 1～1. 6倍が品質の安定性などの点より好ましい。なお直交する二方向への延伸処理の順序は任意であるが、品質の安定性などの点よ

りは、二方向への同時延伸よりも時間的に前後させた一方向ずつの処理方式が好ましい。

【0017】本発明の位相差板は、位相差の調節等を目的に2枚以上を重畳して使用することができる。また他種ポリマーの延伸フィルムからなる位相差板と重畳して使用することもできる。その延伸フィルムを形成する他種ポリマーの種類については特に限定はなく、例えばポリカーボネートやポリエステル、ポリスルホンやポリエーテルスルホン、ポリスチレンやポリオレフィン、ポリビニルアルコールや酢酸セルロース系ポリマー、ポリ塩化ビニルやポリメチルメタクリレートなどがあげられる。

【0018】さらに本発明の位相差板は、偏光板との積層体としても用いることができる。その偏光板には適宜なものを用いることができ、特に限定はない。一般には、ポリビニルアルコールの如き親水性高分子からなるフィルムを、ヨウ素の如き二色性染料で処理して延伸したものや、ポリ塩化ビニルの如きプラスチックフィルムを処理してポリエンを配向させたものなどからなる偏光フィルム、あるいはその偏光フィルムを透明保護層でカバーしたものなどが用いられる。

【0019】なお、位相差板同士や位相差板と偏光板の積層には、例えば透明な接着剤、ないし粘着剤を用いる。その接着剤等の種類については特に限定はない。構成部材の光学特性の変化防止の点よりは、硬化や乾燥の際に高温のプロセスを要しないものが好ましく、長時間の硬化処理や乾燥時間を要しないものが望ましい。かかる粘着層等は、必要に応じて予め位相差板に付設して液晶表示パネル等の被着体に接着できる形態とすることもできる。その場合、粘着層等は実用に供するまでの間、セパレータ等を仮着して保護することが好ましい。

【0020】本発明の位相差板は、位相差の制御を目的とする種々の用途に用いる。特にSTN液晶表示パネルの如く、複屈折による位相差に波長依存性を示すものにおける位相差の補償などに好ましく用いることができる。

【0021】

【実施例】

実施例 1

4, 4'-ジフェニルメタンジイソシアネート500部(重量部、以下同じ)を、3-メチル-1-フェニルホスホレン3部含有のテトラヒドロフラン中、60℃で6時間反応させて得たガラス転移温度が78℃のポリカルボジイミドの溶液をステンレス箔上に塗布し、100℃の熱風で15分間乾燥して厚さ約100μmのフィルムを形成し、それをステンレス箔より分離して80℃で一方向へ1. 5倍延伸して位相差板を得た。

【0022】実施例 2

2, 4-トリレンジイソシアネート500部を、3-メチル-1-フェニルホスホレン6部含有のテトラヒドロ

フラン中、60℃で12時間反応させて得たガラス転移温度が78℃のポリカルボジイミドの溶液をステンレス箔上に塗布し、90℃の熱風で30分間乾燥して厚さ約100μmのフィルムを形成し、それをステンレス箔より分離して、100℃で一方向へ1.4倍延伸し、位相差板を得た。

【0023】比較例1

4,4'-ジフェニルメタンジイソシアネート500部を、3-メチル-1-フェニルホスホレン2部含有のテトラヒドロフラン中、60℃で2時間反応させて得たガラス転移温度が230℃のポリカルボジイミドの溶液をステンレス箔上に塗布し、100℃の熱風で15分間乾燥して厚さ約100μmのフィルムを形成し、それをステンレス箔より分離して100℃で一方向への延伸処理を試みたが、フィルムに可撓性がなくて破断し、温度を170℃に上げた延伸処理も試みたが、架橋の進行でフィルムが着色し実用しうる位相差板が得られなかった。

【0024】比較例2

ヘキサメチレンジイソシアネート500部を、3-メチル-1-フェニルホスホレン3部含有のテトラヒドロフ

10

ラン中、60℃で6時間反応させて得たガラス転移温度が-5℃のポリカルボジイミドの溶液をステンレス箔上に塗布し、室温で減圧乾燥して厚さ約100μmのフィルムを形成し、それをステンレス箔より分離して40℃で一方向への延伸処理を試みたが、室温に温度低下するとフィルムが徐々に収縮して実用しうる位相差板が得られなかった。

【0025】比較例3

厚さ約100μmのポリカーボネートフィルムの延伸物からなる位相差板を用いた。

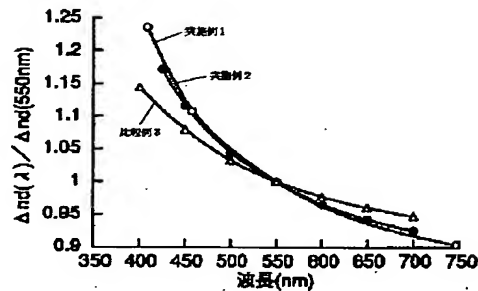
【0026】評価試験

実施例1、2、比較例3で得た位相差板の波長分散性を調べた。その結果を図1に示した。図において縦軸は、550nmの波長光の位相差(Δnd)を基準にして、各波長光(λ)の位相差の割合を示したものである。図より、実施例の位相差板は、比較例よりも高い波長分散性を有していることがわかる。

【図面の簡単な説明】

【図1】実施例、比較例の波長分散性を示したグラフ

【図1】



フロントページの続き

(72)発明者 吉見 裕之
大阪府茨木市下穂積1丁目1番2号 日東
電工株式会社内

(72)発明者 本村 弘則
大阪府茨木市下穂積1丁目1番2号 日東
電工株式会社内

(72)発明者 坂本 亨枝
大阪府茨木市下穂積1丁目1番2号 日東
電工株式会社内

* NOTICES *

JPO and NCIPI are not responsible for any damages caused by the use of this translation.

1. This document has been translated by computer. So the translation may not reflect the original precisely.
2. **** shows the word which can not be translated.
3. In the drawings, any words are not translated.

DETAILED DESCRIPTION

[Detailed Description of the Invention]

[0001]

[Field of the Invention] This invention relates to the suitable phase contrast plate for compensation of the phase contrast in the liquid crystal display panel which has a wavelength dependency in a birefringence, and the manufacture approach of excelling in the production stability.

[0002]

[Background of the Invention] There may be the need of compensating phase contrast with a liquid crystal display panel since there is a problem to which a display colors it by the phase contrast by the birefringence, or contrast falls, the phase contrast by the birefringence is then different for every wavelength like STN mold liquid crystal, and a wavelength dependency may be shown. Although there is also a method which superimposes the liquid crystal display panel in which the same phase contrast property is shown as a cure against compensation of this phase contrast conventionally, since there is a difficulty that the advantage of liquid crystal display panels, such as a lightweight thin shape, is checked with problems, such as bulky-izing and a raise in Shigekazu, compensation with the phase contrast plate which consists of an oriented film is considered.

[0003] What consists of a polycarbonate or polysulfone was known as a phase contrast plate which consists of the oriented film (JP,2-42406,A). However, the polycarbonate system phase contrast plate of the correspondence nature to the liquid crystal display panel in which a wavelength dependency is shown was inadequate, and the scarce trouble was in compensation nature. Moreover, with a polysulfone system phase contrast plate, there was a trouble that heat deflection temperature was high and it was difficult for extension conditions to take advanced homogeneity and for residual stress to obtain locally the phase contrast plate of size required for variation or the liquid crystal display panel which becomes empty without extension nonuniformity.

[0004]

[The technical technical problem of invention] This invention is excellent in the correspondence nature to the wavelength dependency of the phase contrast by the birefringence, is excellent in compensation nature, such as a liquid crystal display panel, and makes a technical problem development of the phase contrast plate which can form easily without extension nonuniformity the thing of size required for a liquid crystal display panel, and is excellent in the stability of production.

[0005]

[Means for Solving the Problem] This invention is a general formula. : $-(R-N=C=N)_n-$

(-- however, R is the organic radical of bivalence and n is 1 or two or more integers.) -- it is expressed and the phase contrast plate characterized by glass transition temperature consisting of an oriented film of the poly carbodiimide which is 0-150 degrees C is offered.

[0006]

[Effect of the Invention] When glass transition temperature consists of a poly carbodiimide which is 0-150 degrees C Controlling the hardening reaction of a carbodiimide and maintaining transparent and colorless nature good, heating softening is carried out and operability can improve extension processing. It can obtain with the sufficient stability of production of the oriented film of the need [that no phase contrast nonuniformity by extension nonuniformity is] size efficiently, and the phase contrast plate which is excellent in the correspondence nature to the wavelength dependency of phase contrast applicable to the STN liquid crystal

display panel of high-speed responsibility etc. can be obtained.

[0007]

[Embodiment of the Invention] The phase contrast plate of this invention is a general formula. : $-(R-N=C=N)_n-$

(-- however, R is the organic radical of bivalence and n is 1 or two or more integers.) -- it is expressed and glass transition temperature consists of an oriented film of the poly carbodiimide which is 0-150 degrees C. It has the structural unit expressed with said general formula by using organic diisocyanate as a monomer component as the poly carbodiimide, and glass transition temperature should just be 0-150 degrees C.

[0008] Incidentally as the aforementioned organic diisocyanate For example, 2 and 4-tolylene diisocyanate, and 2, 6-tolylene diisocyanate, 1-methoxyphenyl -2, 4-diisocyanate, and 4 and 4'-diphenylmethane diisocyanate, 3, 3'-dimethoxy -4, 4'-diphenylmethane diisocyanate, and 3, the 3'-dimethyl -4, 4'-diphenylmethane diisocyanate, Although one sort, such as 4 and 4'-diphenyl ether diisocyanate, and 3,3'-dimethyl-4,4'-diphenyletherdiisocyanate, omicron-tolylene diisocyanate, or two sorts or more are used, it does not limit to these.

[0009] although the poly carbodiimide may form organic diisocyanate by the method with the method proper in an organic solvent made to react to the bottom of existence of carbodiimide-ized catalysts, such as phospholene oxide, (JP,2-292316,A, JP,4-275359,A, J.appl.Polym.Sci.21, PP(s)1999 (1977:L.M.Alberino etc.)) -- this invention -- if -- in order to attain the desired end, such as extension nonuniformity control, it is required to be the poly carbodiimide whose glass transition temperature is 0-150 degrees C.

[0010] glass transition temperature -- the less than 0-degree C poly carbodiimide -- near ordinary temperature -- the shape of rubber sake -- handling -- hard -- the temperature control at the time of extension processing etc. is difficult, and the phase contrast plate by which quality was stabilized is hard to be obtained. On the other hand, also in the poly carbodiimide to which glass transition temperature exceeds 150 degrees C, crosslinking reaction becomes easy to advance by whenever [stoving temperature / which enables extension processing], and problems, such as coloring-izing and *****, are generated. 30-140 degrees C of glass transition temperature of the poly carbodiimide which can be used more preferably than points, such as handling nature and crosslinking reaction control nature, are 50-120 degrees C above all.

[0011] In addition, as an example of the phospholene oxide used for the above mentioned carbodiimide-ized catalyst, 1-phenyl-2-phospholene-1-oxide, 3-methyl-2-phospholene-1-oxide, 1-ethyl-2-phospholene-1-oxide, 1-ethyl-2-phospholene-1-oxide, 3-methyl-1-phenyl phospholene, 3-phospholene isomer, etc. are raised.

[0012] Although a phase contrast plate can be formed by producing the poly carbodiimide by the proper method and carrying out extension processing, it is the approach of carrying out extension processing of the film production which the manufacture approach more desirable than points, such as the stability of quality and productive efficiency, carried out flow casting desiccation of the solution by the solvent of the poly carbodiimide by proper methods, such as the casting method, and obtained.

[0013] Proper things, such as an organic solvent used as a solvent for preparing the solution of the poly carbodiimide in case the poly carbodiimide is formed, for example, can be used. Incidentally as the example, the ketones like the halogenated hydrocarbon like tetrachloroethylene, 1,2-dichloroethane, or chloroform, an acetone and a methyl ethyl ketone, methyl isobutyl ketone, or a cyclohexanone, the cyclic ether like a tetrahydrofuran or dioxane, those mixed stock, etc. are raised.

[0014] As a drying temperature of the flow casting layer of the poly carbodiimide solution, 60-120 degrees C is more desirable than points, such as film fracture at the time of the extension processing by control of the dependability on the strength and handling nature of the film obtained, and crosslinking reaction, and prevention of poor extension, above all 50-150 degrees C. The phase contrast property of the phase contrast plate made into the purpose etc. may determine the thickness of the film to form suitably. Especially generally 5-300-micrometer 500 micrometers or less are set to 10-200 micrometers above all. Incidentally phase contrast is computable as a product (**n-d) of the refractive-index difference (**n) of a birefringence, and the thickness (d) of a phase contrast plate.

[0015] Proper methods, such as for example, the roll extending method, the long gap ***** method, the tenter extending method, and the tubular extending method, can perform extension processing, and it can take proper extension methods, such as one shaft and two shafts. Processing temperature has 40-120 degrees C more desirable than points, such as control of crosslinking reaction, and prevention of extension nonuniformity, above all 150 degrees C or less. At low temperature, such as ordinary temperature, it is easy to produce a fracture problem etc., and lacking in extension processability.

[0016] Although the uniaxial-stretching processing extended only to an one direction like the above is sufficient as extension conditions, biaxial-stretching mode of processing and its biaxial-stretching mode of processing extended above all in the two directions which intersect perpendicularly are more desirable than points, such as relaxation of the property which tends to be torn by shock-proof improvement and the one direction. The extension conditions in that case have 1.1 to 1.6 times twice [one to] as desirable as points, such as the stability of quality, above all to the direction which intersects perpendicularly with 1.2 to twice, and its direction above all 1.1 to 5 times to a predetermined one direction. In addition, although the sequence of the extension processing to two directions which intersect perpendicularly is arbitrary, mode of processing of every an one direction made to get mixed up in time than the coincidence extension to two directions is more desirable than points, such as the stability of quality.

[0017] Two or more sheets can be superimposed and used for the phase contrast plate of this invention for the purpose of accommodation of phase contrast etc. Moreover, it can also be used for the phase contrast plate which consists of an oriented film of an other type polymer, superimposing. There is especially no limitation about the class of other type polymer which forms the oriented film, for example, a polycarbonate, polyester, polysulfone and polyether sulphone, polystyrene and polyolefine, polyvinyl alcohol and a cellulose acetate system polymer, a polyvinyl chloride, polymethylmethacrylate, etc. are raised.

[0018] Furthermore, the phase contrast plate of this invention can be used also as a layered product with a polarizing plate. A proper thing can be used for the polarizing plate, and there is especially no limitation. The polarization film which consists of what generally processed and extended the film which consists of a hydrophilic macromolecule like polyvinyl alcohol by the dichromatic dye like iodine, a thing to which the plastic film like a polyvinyl chloride was processed and orientation of the polyene was carried out, or the thing which covered the polarization film by transparent protection layer is used.

[0019] In addition, transparent adhesives thru/or a binder can be used for the laminating of phase contrast plates, a phase contrast plate, and a polarizing plate, for example. There is especially no limitation about the class of the adhesives etc. What does not require a hot process in the case of hardening or desiccation is desirable, and what does not require hardening processing or the drying time of long duration is more desirable than the point of change prevention of the optical property of a configuration member. This adhesive layer etc. can also be made into the gestalt which attaches to a phase contrast plate beforehand if needed, and can be pasted up on adherends, such as a liquid crystal display panel. In that case, it is desirable to install tentatively and protect a separator etc. until it presents practical use with an adhesive layer etc.

[0020] The phase contrast plate of this invention can be used for the various applications aiming at control of phase contrast. It can use for compensation of the phase contrast in what shows a wavelength dependency to the phase contrast by the birefringence etc. preferably like a STN liquid crystal display panel especially.

[0021]

[Example]

an example 14 and the 4'-diphenylmethane diisocyanate 500 section (the weight section --) the following -- being the same -- among the tetrahydrofuran of 3-methyl-1-phenyl phospholene 3 section content The solution of the poly carbodiimide whose glass transition temperature which was made to react for 6 hours and was obtained at 60 degrees C is 78 degrees C is applied on a stainless steel foil. It dried for 15 minutes by 100-degree C hot blast, the film with a thickness of about 100 micrometers was formed, it was separated from the stainless steel foil, it extended 1.5 times to the one direction at 80 degrees C, and the phase contrast plate was obtained.

[0022] An example 22 and the 4-tolylene diisocyanate 500 section The inside of the tetrahydrofuran of 3-methyl-1-phenyl phospholene 6 section content, Apply the solution of the poly carbodiimide whose glass transition temperature which was made to react for 12 hours and was obtained at 60 degrees C is 78 degrees C on a stainless steel foil, dry for 30 minutes by 90-degree C hot blast, form a film with a thickness of about 100 micrometers, and it is separated from a stainless steel foil. It extended 1.4 times to the one direction at 100 degrees C, and the phase contrast plate was obtained.

[0023] The example 14 of a comparison, and the 4'-diphenylmethane diisocyanate 500 section The inside of the tetrahydrofuran of 3-methyl-1-phenyl phospholene 2 section content, Although applied the solution of the poly carbodiimide which is 230 degrees C on the stainless steel foil, and the glass transition temperature which was made to react for 2 hours and was obtained at 60 degrees C dried for 15 minutes by 100-degree C hot blast, formed the film with a thickness of about 100 micrometers, separated it from the stainless steel foil and tried the extension processing to an one direction at 100 degrees C There is no flexibility in a film and it fractured, and

although the extension processing which raised temperature to 170 degrees C was also tried, the phase contrast plate which a film can color and by advance of bridge formation was not obtained.

[0024] The example of comparison 2 hexamethylene-di-isocyanate 500 section The inside of the tetrahydrofuran of 3-methyl-1-phenyl phospholene 3 section content, Although applied the solution of the poly carbodiimide which is -5 degrees C on the stainless steel foil, and the glass transition temperature which was made to react for 6 hours and was obtained at 60 degrees C carried out reduced pressure drying at the room temperature, formed the film with a thickness of about 100 micrometers, separated it from the stainless steel foil and tried the extension processing to an one direction at 40 degrees C The phase contrast plate which can be used for a room temperature by a film contracting gradually if a temperature fall is carried out was not obtained.

[0025] The phase contrast plate which consists of an extension object of a polycarbonate film with an example of comparison 3 thickness of about 100 micrometers was used.

[0026] The wavelength dispersion nature of the phase contrast plate obtained in the evaluation trial examples 1 and 2 and the example 3 of a comparison was investigated. The result was shown in drawing 1 . In drawing, an axis of ordinate shows the rate of the phase contrast of each wavelength light (λ) on the basis of the phase contrast (**nd) of 550nm wavelength light. Drawing shows that the phase contrast plate of an example has wavelength dispersion nature higher than the example of a comparison.

[Translation done.]

* NOTICES *

JPO and NCIPi are not responsible for any damages caused by the use of this translation.

1. This document has been translated by computer. So the translation may not reflect the original precisely.
2. **** shows the word which can not be translated.
3. In the drawings, any words are not translated.

CLAIMS

[Claim(s)]

[Claim 1] General formula : $-(R-N=C=N)_n-$

((R is the organic radical of bivalence.) However, n is 1 or two or more integers.) The phase contrast plate characterized by being expressed and glass transition temperature consisting of an oriented film of the poly carbodiimide which is 0-150 degrees C.

[Claim 2] General formula : $-(R-N=C=N)_n-$

((R is the organic radical of bivalence.) However, n is 1 or two or more integers.) The manufacture approach of the phase contrast plate characterized by carrying out extension processing of the film production which was expressed, carried out flow casting desiccation and obtained the solution by the solvent of the poly carbodiimide whose glass transition temperature is 0-150 degrees C.

[Translation done.]

**This Page is Inserted by IFW Indexing and Scanning
Operations and is not part of the Official Record**

BEST AVAILABLE IMAGES

Defective images within this document are accurate representations of the original documents submitted by the applicant.

Defects in the images include but are not limited to the items checked:

- ☐ BLACK BORDERS
- ☐ IMAGE CUT OFF AT TOP, BOTTOM OR SIDES
- ☐ FADED TEXT OR DRAWING
- ☐ BLURRED OR ILLEGIBLE TEXT OR DRAWING
- ☐ SKEWED/SLANTED IMAGES
- ☐ COLOR OR BLACK AND WHITE PHOTOGRAPHS
- ☐ GRAY SCALE DOCUMENTS
- ☒ LINES OR MARKS ON ORIGINAL DOCUMENT
- ☐ REFERENCE(S) OR EXHIBIT(S) SUBMITTED ARE POOR QUALITY
- ☐ OTHER: _____

IMAGES ARE BEST AVAILABLE COPY.

As rescanning these documents will not correct the image problems checked, please do not report these problems to the IFW Image Problem Mailbox.